

AUIPS7091 Datasheet



DiGi Electronics Part Number	AUIPS7091-DG
Manufacturer	Infineon Technologies
Manufacturer Product Number	AUIPS7091
Description	IC PWR SWITCH N-CHAN 1:1 TO220-5
Detailed Description	Power Switch/Driver 1:1 N-Channel 2A TO-220-5

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Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
AUIPS7091	Infineon Technologies
Series:	Product Status:
	Obsolete
Switch Type:	Number of Outputs:
General Purpose	1
Ratio - Input:Output:	Output Configuration:
1:1	High Side
Output Type:	Interface:
N-Channel	On/Off
Voltage - Load:	Voltage - Supply (Vcc/Vdd):
6V ~ 35V	Not Required
Current - Output (Max):	Rds On (Typ):
2A	80mOhm
Input Type:	Features:
Non-Inverting	Auto Restart
Fault Protection:	Operating Temperature:
Current Limiting (Fixed), Open Load Detect, Over Temperature	-40°C ~ 150°C (TJ)
Grade:	Qualification:
Automotive	AEC-Q100
Mounting Type:	Supplier Device Package:
Through Hole	TO-220-5
Package / Case:	Base Product Number:
TO-220-5	AUIPS7091

Environmental & Export classification

Moisture Sensitivity Level (MSL):	REACH Status:
1 (Unlimited)	REACH Unaffected
ECCN:	HTSUS:
EAR99	8542.39.0001

International **TOR** Rectifier___

March, 26th 2012 Automotive grade

120mo max.

SO-8

70V

3V

D2-Pak

AUIPS7091PbF AUIPS7091SPbF AUIPS7091GPbF

5A (typ.)

AUIPS7091(G)(S)PbF

INTELLIGENT POWER HIGH SIDE SWITCH

Package

TO220

Product Summary

Rds(on)

Vclamp

Open load

I Limit

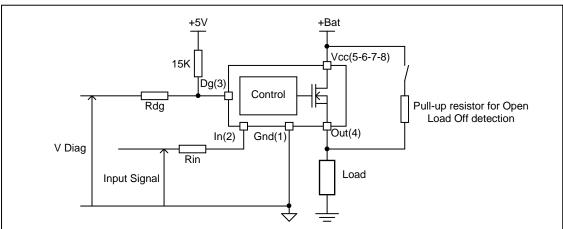
Features

- Over temperature shutdown (with auto-restart)
- Short circuit protection (current limit)
- Active clamp
- Open load detection
- Logic ground isolated from power ground
- ESD protection
- Ground loss protection
- Status feedback

Description

The AUIPS7091(G)(S)PbF is a five terminal Intelligent Power Switch (IPS) with built in short circuit, overtemperature, ESD protection, inductive load capability and diagnostic feedback. The output current is limited at Ilim value. Current limitation is activated until the thermal protection acts. The over-temperature protection turns off the device if the junction temperature exceeds Tshutdown. It will automatically restart after the junction has cooled 7°C below Tshutdown. A diagnostic pin is provided for status feedback of short circuit, over-temperature and open load detection. The double level shifter circuitry allows large offsets between the logic ground and the load.

Typical Connection





AUIPS7091(G)(S)PbF

Qualification Information⁺

Qualification Level		(per AEC-Q100)				
Quann		Comments: This family of ICs has passed an Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.				
		D2PAK-5L	MSL1, 260°C (per IPC/JEDEC J-STD-020)			
Moisture Sensitivity Level		TO-220	Not applicable (non-surface mount package style)			
		SOIC-8	MSL2, 260°C (per IPC/JEDEC J-STD-020)			
	Machine Model	Class M2 (+/-200V)				
		(per AEC-Q100-003)				
ESD	Luman Dady Madal	Class H2 (+/-4000V)				
E3D	Human Body Model	(per AEC-Q100-002)				
	Charged Davies Medal	Class C4 (+/-1000V)				
Charged Device Model		(per AEC-Q100-011)				
IC Latch-Up Test		Class II, Level A				
		(per AEC-Q100-004)				
RoHS	Compliant		Yes			
+ Qualification standards can be found at International Rectifier's web site http://www.irf.com/						

† Qualification standards can be found at International Rectifier's web site <u>http://www.irf.com/</u>

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Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are referenced to Ground lead. Tj= -40°C..150°C, Vcc=6..35V (unless otherwise specified).

Symbol	Parameter	Min.	Max.	Units
Vout	Maximum output voltage	Vcc-63	Vcc+0.3	
Voffset	Maximum logic ground to load ground offset	Vcc-63	Vcc+0.3	
Vin	Maximum input voltage	-0.3	5.5	V
Vcc max.	Maximum Vcc voltage	_	60	v
Vcc cont.	Maximum continuous Vcc voltage	_	35	
Vcc sc.	Maximum Vcc voltage with short circuit protection with Tj < -10°C	_	28	
lin max.	Maximum IN current	-1	10	m۸
ldg max.	Maximum diagnostic output current	-1	10	mA
Vdg	Maximum diagnostic output voltage	-0.3	5.5	V
Pd	Maximum power dissipation (internally limited by thermal protection) Rth=100°C/W	_	1.25	W
Isd cont.	Maximum continuous diode current (Rth=100°C/W)	_	1.8	А
ESD1	Electrostatic discharge voltage (Human body) 100pF, 1500 Ω		4	1.3.7
ESD2	Electrostatic discharge voltage (Machine Model) C=200pF,R=0Ω,L=10μH	_	0.5	kV
Tj op max.	Max. operating temperature junction temperature	-40	+150	°C
Tj Sto max.	Max. storage temperature junction temperature	-55	+150	°C

Thermal Characteristics

Symbol	Parameter	Тур.	Max.	Units
Rth1	Thermal resistance junction to ambient SO8 std. footprint	100	_	
Rth1	Thermal resistance junction to ambient TO220 free air	60	_	
Rth1	Thermal resistance junction to ambient D2Pak std. footprint	60	_	°C/W
Rth2	Thermal resistance junction to ambient D2Pak 1" sqrt. footprint	40	_	
Rth3	Thermal resistance junction to case D2pak/TO220	4	_	

Recommended Operating Conditions

These values are given for a quick design. For operation outside these conditions, please consult the application notes.

Symbol	Parameter	Min.	Max.	Units
VIH	High level input voltage	4	5.5	V
VIL	Low level input voltage	-0.3	0.9	v
lout	Continuous drain current, Tamb=85°C, Tj=125°C, Vin=5V, Rth=100°C/W	_	1.5	А
Rin	Recommended resistor in series with IN pin	10	20	
Rdgs	Recommended resistor in series with DG pin	10	20	kΩ
Rol	Recommended pull-up resistor for open load detection	5	100	

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Static Electrical Characteristics

Tj=-40..150°C, Vcc=6..35V (unless otherwise specified), typical values are given for Vcc=14V and Tj=25°C

Symbol	Parameter	Min.	Тур.	Max.	Units	Test Conditions
	ON state resistance Tj=25°C	_	80	120		Vin=5V, Iout=2A
Rds(on)	ON state resistance Tj=150°C	_	150	230	mΩ	Vin=5V, Iout=2A
	ON state resistance Tj=25°C, Vcc=6.5V	_	90	130		Vin=5V, Iout=2A
Vcc op.	Operating voltage range	6	—	35		
V clamp	Vcc to Out clamp voltage	63	70	—	V	lout=30mA (see Fig. 1)
Vf	Body diode forward voltage	—	1	1.4		lout= 2.5A
Icc Off	Supply current when Off	—	2.5	10	μA	Vin=Vout=0V, Tj=25°C
Icc On	Supply current when On	_	2.5	4	mA	Vin=5V, Vcc=14V
lout@0V	Output leakage current	_	-	10		Vout=0V
lout@6V	Output leakage current	_	20	_	μA	Vout=6V
ldg leakage	Diagnostic output leakage current	_	_	10		Vdg=5.5V
Vdgl	Low level diagnostic output voltage	—	0.1	0.3		ldg=1.6mA
Vih	Input high threshold voltage	_	2.5	3.5		
Vil	Input low threshold voltage	1	2	—		
In hys	Input hysteresis	0.05	0.4	1	V	
UV high	Under voltage high threshold voltage		5	6.2		
UV low	Under voltage low threshold voltage	3	4.5	5.9	1	
UV hys	Under voltage hysteresis	0.1	0.8	1.5	1	
lin On	Input current when device is On		40	80	μA	Vin=5V

Switching Electrical Characteristics

Vcc=14V, Resistive load=6Ω, Vin=5V, Tj=-40°C..150°C, typical values are given for Tj=25°C

Symbol	Parameter	Min.	Тур.	Max.	Units	Test Conditions
Tdon	Turn-on delay time		12	35		
Tr1	Rise time to Vout=Vcc-5V	—	7	40	μs	
Tr2	Rise time to Vout=0.9 x Vcc	_	14	50	-	
dV/dt (On)	Turn On dV/dt		0.95	5	V/µs	
EOn	Turn On energy		250		μJ	See Fig. 3
Tdoff	Turn-off delay time		20	45		
Tf	Fall time to Vout=0.1 x Vcc		6	25	μs	
dV/dt (Off)	Turn Off dV/dt	—	1.8	5	V/µs	
EOff	Turn Off energy	_	20		μJ]
Tdiag	Vout to Vdiag propagation delay		15		μs	See Fig. 4 and Fig. 12

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Protection Characteristics

Tj=-40..150°C, Vcc=6..35V (unless otherwise specified), typical values are given for Vcc=14V and Tj=25°C

Symbol	Parameter	Min.	Тур.	Max.	Units	Test Conditions
llim	Internal current limit	2	5	8	Α	Vout=0V, Tj=25°C
Tsd+	Over temperature high threshold	150 ⁽¹⁾	165	_	°C	See Fig. 2
Tsd-	Over temperature low threshold		158	-	U	See Fig. 2
Vsc	Short-circuit detection voltage (2)	2	3	4	V	
Vopen load	Open load detection threshold	2	3	4	v	

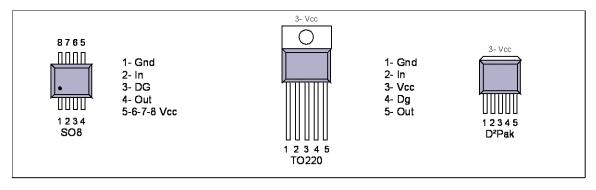
⁽¹⁾ Guaranteed by design ⁽²⁾ Reference to Vcc

Truth Table

Operating Conditions	IN	OUT	DG pin
Normal	Н	Н	Н
Normal	L	L	L
Open Load	Н	Н	Н
Open Load ⁽³⁾	L	Н	Н
Short circuit to Gnd	Н	L (limiting)	L
Short circuit to Gnd	L	L	L
Over-temperature	Н	L (cycling)	L
Over-temperature	L	L	L

⁽³⁾ With a pull-up resistor connected between the output and Vcc.

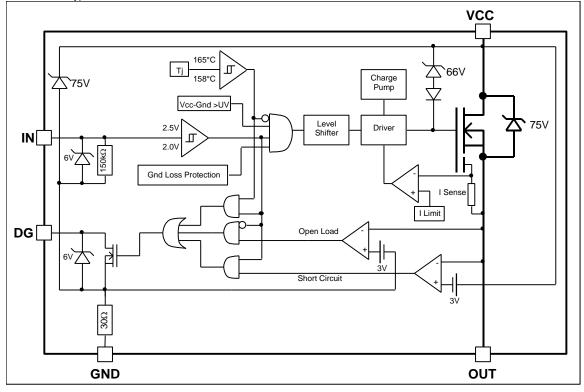
Lead Assignments



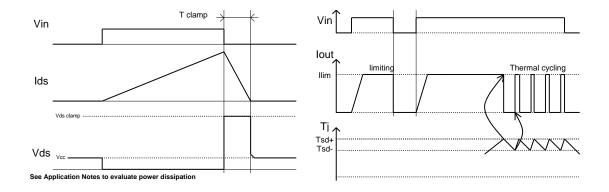
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Functional Block Diagram

All values are typical



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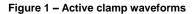
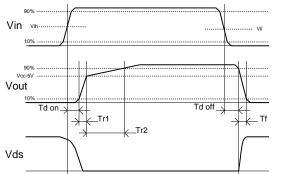
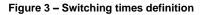


Figure 2 – Protection timing diagram





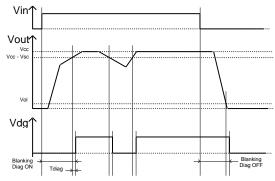


Figure 4 – Diagnostic delay definition

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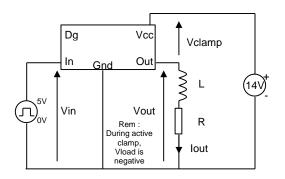


Figure 5 – Active clamp test circuit

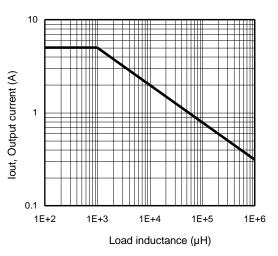
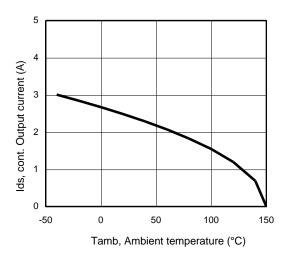


Figure 6 – Max. Output current (A) Vs Load inductance (µH)

100.0

10.0



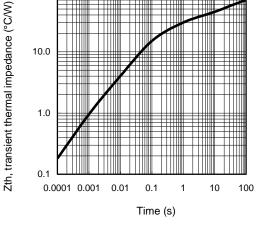


Figure 7 - Max. ouput current (A) Vs Ambient temperature (°C) Rth=100°C/W

Figure 8 – Transient thermal impedance (°C/W) Vs time (s)

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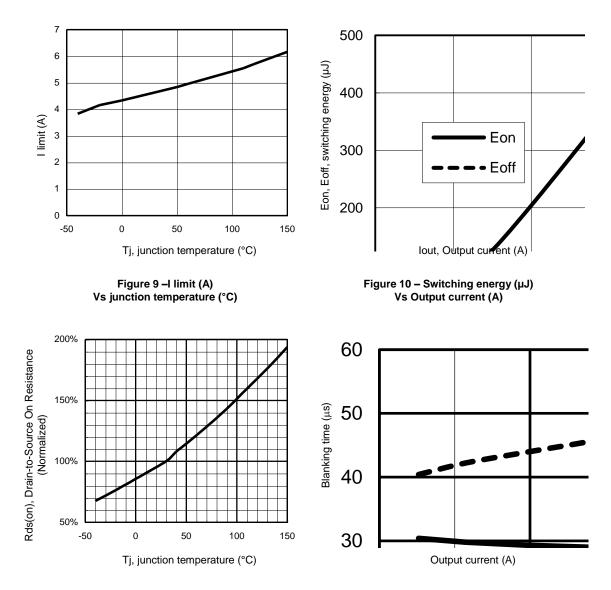


Figure 12 – Diagnostic Blanking time (μs) Vs Output current (A)

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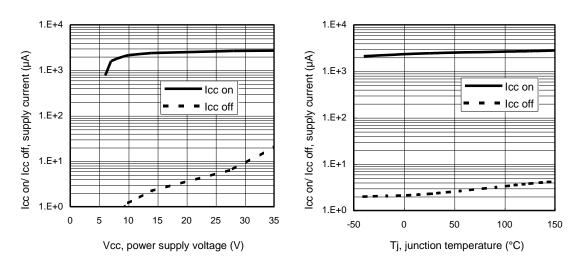


Figure 13 – Icc on/ Icc off (µA) Vs Vcc (V)

Figure 14 – Icc on/ Icc off (µA) Vs Tj (°C)

<u>∧</u> <u>∧</u>

c

- A2

B SEATING PLANE

A-

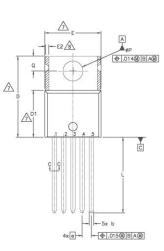
A1

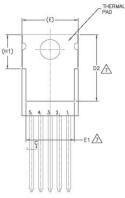
A

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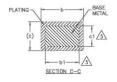
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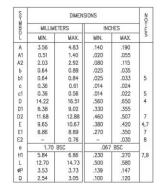
Case outline - TO220











NOTES:

NOTES: 1.— DURENSIONING AND TOLERANCING AS PER ASME '14.5 M.— 1994. 2.— DURENSIONS ARE SHOWN IN INCHES [MILLIMETERS]. 3.— LEAD DURENSION AND FUEND WITCHTERS IN II. 4.— DIMENSION D, DI & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT DUCED. 0.05' (0.127) PER SDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERWIST EXTERLES OF THE PLASTIC BODY. C.— CONTROLING DUMENSION IS EXTERLES OF THE PLASTIC BODY. 6.— CONTROLING DUMENSION IS CONTENDED. SONS E,1H.D2 & E1 8.— DUMENSION E 2X HID DEFINE A ZONE WHERE STANPING.

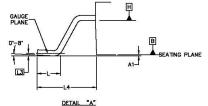
8.-

- 9.-
- Inermal, PAD Control of India, Initian Junchandre, Entrol & El DIMENSION E 2: HI DETRIE A CONE WHERE STANPING AND SINGULATION IRREGULARITES ARE ALLOWED. OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (mox.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

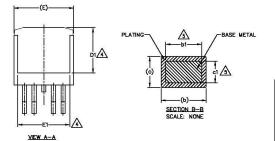
10.- LEADS AND DRAIN ARE PLATED WITH 100% Sn

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Case outline – D²Pak







1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M-1994 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].

NOTES:

DIMENSION D & E DD NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.

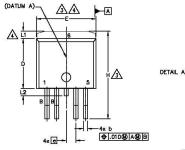
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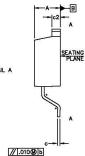
THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.

DIMENSION 61 AND c1 APPLY TO BASE METAL ONLY.

6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.

- 7. CONTROLLING DIMENSION: INCH.
- 8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263BA.
- 9 LEADS AND DRAIN ARE PLATED : 100% Sn

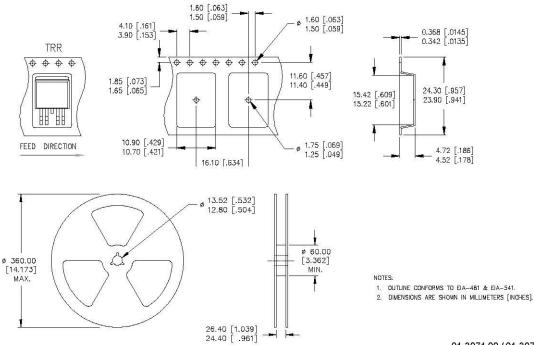




S Y		N			
M B O	мши	IETERS	INC	NOTES	
Ľ	MIN.	MAX.	MIN.	MAX.	Š
A	4.06	4.83	.160	.190	
A1	-	0.254	-	.010	
b	0.51	0.99	.020	.039	4
b1	D.51	0.89	.020	.035	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	4
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	-	.270	-	
Е	9.65	10.67	.380	.420	3
E1	6.22	-	.245	-	
e	1.70	BSC	.067	BSC	
н	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	-	1.68	-	.066	
L2	-	1.78	-	.070	
L3	0.25	BSC	.010	BSC	
L4	4.78	5.28	.188	.208	

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Tape and reel – D²Pak

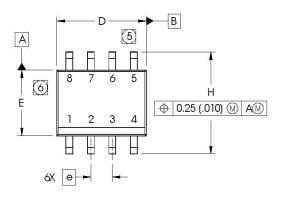


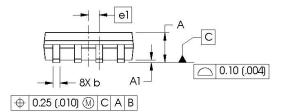
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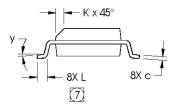
Case Outline - SO-8

Dimensions are shown in millimeters (inches)



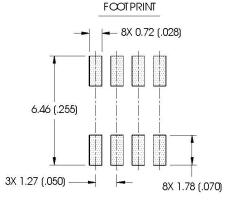


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
Α	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
С	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
е	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
Н	.2284	.2440	5.80	6.20
К	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
У	0°	8°	0°	8°



NOTES:

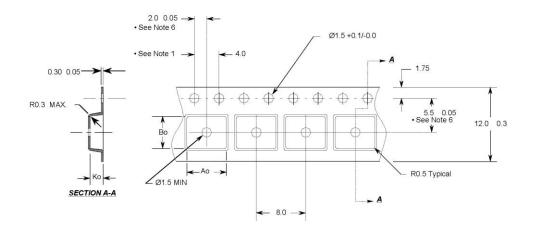
- 1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
- 2. CONTROLLING DIMENSION: MILLIMETER
- 3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
- 4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- (6) DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS, MOLD PROTRUSIONS NOT TO EXCEED 0.15 (.006).
- (6) DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.010).
- DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.



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Tape & Reel - SO-8



Ao = 6.4 mm

Bo = 5.2 mm

Ko = 2.1 mm

Notes:

- 1. 10 sprocket hole pitch cumulative tolerance 0.2
- 2. Camber not to exceed 1mm in 100mm
- 3. Material: Black Conductive Advantek Polystyrene
- 4. Ao and Bo measured on a plane 0.3mm above the

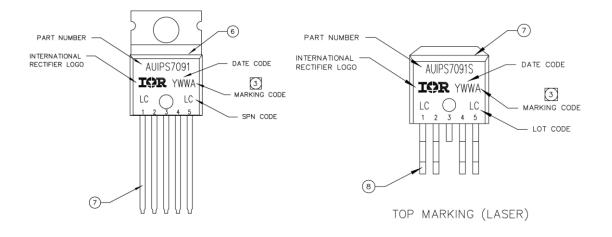
bottom of the pocket

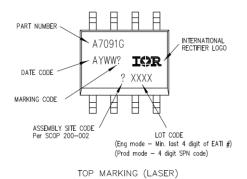
- 5. Ko measured from a plane on the inside bottom of the
- pocket to the top surface of the carrier.
- Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

- All Dimensions in Millimeters -

AUIPS7091(G)(S)PbF

Part Marking Information







AUIPS7091(G)(S)PbF

Ordering Information

Base Part Number		Standard Pack		
Dase i alt indiliber	Package Type	Package Type Complet	Complete Part Number	
AUIPS7091	TO220-5-Leads	Tube	50	AUIPS7091
		Tube	50	AUIPS7091S
AUIPS7091S	D2-Pak-5-Leads	Tape and reel left	800	AUIPS7091STRL
		Tape and reel right	800	AUIPS7091STRR
AUIPS7091G	SOIC-8	Tube	95	AUIPS7091G
AUFS7091G	3010-0	Tape and reel	2500	AUIPS7091GTR

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Revision History

Revision	Date	
		Notes/Changes
A1	October 2011	First release
В	March 2012	Remove the preliminary mention



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